

# Vermont Rivers and Roads Training Program

## 2015 Progress Report



December, 2015





## Introduction

Following Tropical Storm Irene, Vermont recognized the need to create a training program for persons involved with in-stream work. In particular state and local road maintenance personnel need exposure and experience with practices that minimize impacts to river stability and aquatic habitats and maximize infrastructure stability. The Vtrans Post-Irene Task Force issued a recommendation to, “Expand VTrans, municipal, RPC and private sector operational knowledge of river dynamics at various levels.” The legislature passed Act 138 which called for ANR to, “Provide training on how to conduct stream alterations... activities necessary during...emergency conditions that pose an imminent risk to life or a risk of damage to public or private property... these trainings shall be made available to municipal, state and federal agency personnel.” The Agency of Natural Resources also recognized the benefits that such training would accrue and allocated a river engineering staff position to work in conjunction with Vtrans and the Vermont Fish and Wildlife Department to develop and deliver the Rivers and Roads Training Program.

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## Meeting On the Ground Needs

During flood emergency and recovery scenarios VTrans Maintenance and Equipment Workers and Municipal road crews are on the front lines. River Management Engineer staffing limitations mean that VTrans operational staff have often had to implement recovery measures without technical assistance from ANR River Management Engineers. In these cases, operations staff can call upon design and engineering assistance from within VTrans but that assistance is limited in capacity and river engineering expertise.

With tight budgets and a lack of private sector expertise to draw on, municipal Road crews are heavily reliant on ANR River Management Engineers for technical assistance. The consideration of river processes that promote long term river equilibrium (stability) and sustain quality habitat is relatively new in the engineering and design fields and there is not yet a widely held expertise amongst design professionals within the private sector. Furthermore, municipal financial constraints restrict the extent to which municipal crews are able to utilize private sector expertise. Thus, the private sector does not at this time represent a sufficient resource to support flood recovery at the municipal level.

In addition to serving Vtrans and municipal road crews, the ANR River Management Engineers also serve private citizens and businesses during flood emergency and recovery periods. Private entities face the same financial and available technical assistance constraints that state and municipal entities do. This all creates a demand for ANR River Management Engineer assistance that can quickly outstrip capacity and results in instream work being conducted without sufficient technical assistance.

Another scenario that can lead to instream work being conducted without appropriate technical assistance is that of an imminent threat to life or property. When an imminent threat emerges there may not be time to wait for technical assistance before taking action. While imminent threats may absolutely justify instream work conducted in the absence of technical assistance, it is also true that misinformed instream work, even when conducted with the intent of mitigating hazard can actually significantly increase hazard level.

In the absence of technical assistance, the degree of instream work conducted during flood recovery is in many cases excessive and only creates greater instability. In other cases the degree of work is appropriate but a lack

of understanding of river processes leads to a less than ideal outcome. It is inevitable that technical assistance capacity will be overwhelmed during flood recovery periods. In order to increase Vermont's capacity to recover from flood events in a manner that increases Vermont's flood resiliency, the professionals who repeatedly find themselves on the front lines of flood recovery must be instilled with a basic level of knowledge of river processes, aquatic habitats and appropriate and effective instream construction practices. This understanding will enable them to make better decisions about when and how to restore damaged infrastructure when technical assistance is not available. To that end the Rivers and Roads training is designed to:

1. Give front line transportation workers the ability to identify the degree and type of instability present at a particular river-road conflict site;
2. Give front line transportation workers the ability to estimate the degree of difficulty associated with rebuilding flood damaged infrastructure in a manner that accommodates stream equilibrium so that they know when and when not to take action without technical assistance;
3. Give front line transportation workers the ability to rebuild flood damaged infrastructure while accommodating stream equilibrium and habitat features in less difficult situations;
4. Increase the capacity of VTrans design and engineering staff and private sector engineers to provide assistance on those projects where accommodating stream equilibrium is more difficult.

As importantly, the training will increase general awareness and technical knowledge of river dynamics and habitat, so that better decisions can be made by professionals on the ground under normal situations on a day-to-day basis.

### **Target Audiences and Course Descriptions**

A myriad of skill sets are involved with design, construction and maintenance of transportation infrastructure. Not every transportation profession will use nor requires the same degree of training. Not all transportation professionals have the same degree of experience and formal education. These realities create a challenge to the effort of providing training in an efficient and effective method. To overcome this challenge the Rivers and Roads training has been developed as a tiered training in order to provide the appropriate degree of training to the various target audiences. Those audiences include:

- VTrans technical and operational staff,
- Municipal road crew personnel,
- Private sector engineers,
- Private sector equipment operators, and
- Regional Planning Commission and VTrans transportation planners.

#### *Tier One Description*

The Tier One training is an online self-guided training that creates a general awareness and understanding of: the societal value of rivers, physical river processes, aquatic habitat; the implications of historical river management, and how transportation infrastructure affects and is affected by physical river processes.

#### *Tier Two Description*

The Tier Two training is a classroom and field based training targeting the range of design, construction, maintenance and planning professionals. Tier 2 delves more deeply into the topics of physical river processes, aquatic habitat and the interactions between rivers and adjacent infrastructure. Tier 2 also explains the permitting process and standards that must be met when emergency protective measures implemented to mitigate imminent threats are authorized locally. The subject matter is presented via slide presentations and reinforced with in-field observations and discussion, and hands on construction exercises in river simulation models. Throughout the course of the training participants come to understand that maximizing the accommodation of natural river processes leads to more robust riverside infrastructure. An emphasis is placed

on accommodating stream equilibrium, avoiding practices that trigger further instability, and minimizing impacts to aquatic habitat during emergency flood response and recovery operations when technical support is not available. Specific topics include:

- Lateral and vertical river stability;
- Equilibrium channel width and boundary resistance
- Reconstructing transportation infrastructure without creating or exacerbating vertical river instability,
- Recognizing where technical assistance is required to accommodate channel equilibrium.

### *Tier Three Description*

The Tier 3 training is currently under development, will be completed in the spring of 2016 and delivery will begin in the winter of 2016. Tier 3 will focus on advanced engineering and construction oversight topics, specifically the design and construction oversight of the stream alteration practices outlined the Vermont Standard River Management Principles and Practices document (2014). Because of its advanced and in-depth nature, the T3 training will be developed as a series of modules with each module addressing approximately two stream alteration practices. The Tier 2 training will be a prerequisite to the T3 training.

### *Class Sizes*

The overall number of potential participants for each tier is large and the desired timeframe for getting those participants trained is short. An effective training program requires multi-day courses with small instructor to participant ratios. The below tables and graphs present a participant estimate and participant-instructor ratios for Tiers 2 and 3 trainings.

Table 1. Participant community and class sizes.

Estimated Number of Participants				Class Sizes		
	VTrans	Other*	Total	Instructors Per Class	Participants Per Class	Participant Instructor Ratio
<b>Tier 1</b>	200	316	<b>516</b>	N/A	N/A	N/A
<b>Tier 2</b>	200	301	<b>501</b>	3	25	8.3
<b>Tier 3</b>	40	50	<b>90</b>	2	15	7.5

\*Includes participants from municipalities, regional planning commissions and the private sector.

### **Progress to Date**

#### *Tier 1 Trainings*

Because the Tier 1 training is self-guided and offered via the internet with unrestricted access, visits are not tracked and it is not possible to state how many individuals have taken the training. However, the Tier 1 training is a prerequisite to the Tier 2 training and based on informal surveys of Tier 2 participants it is estimated that 90-95% of all Tier 2 participants have taken the Tier 1 training.

#### *Tier 2 Trainings*

In October of 2012 a pilot Rivers and Roads Tier 2 Training was held for the purposes of testing the program as it had been developed at that point in time. Twenty Five Vtrans staff participated in the pilot training program. In 2013 four Tier 2 trainings were offered to VTrans staff at the Vtrans Training Center in Berlin, VT and field sites in Berlin and Waterbury. Approximately 20 Vtrans staff participated in each of these trainings resulting in a total of 80 Vtrans staff trained.

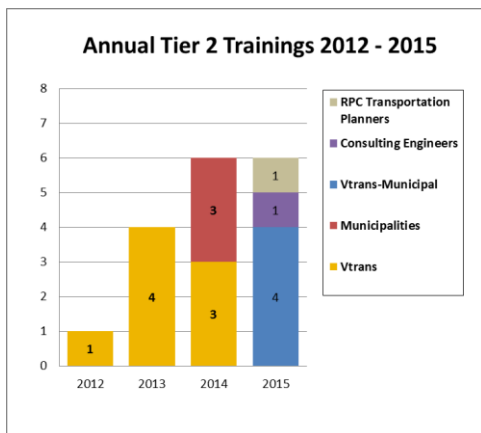


Figure 1. Tier 2 Training offerings, 2012 - 2015

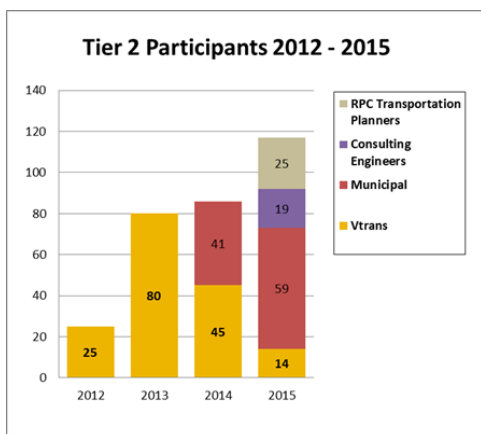


Figure 2. Tier 2 participant numbers grouped by organization.

In 2014 three Tier 2 trainings were offered to Vtrans staff at the Vtrans Training Center in Berlin. Three Tier 2 trainings were offered to municipal road crew members, local officials and regional planners at regional locations including Berlin, Mendon and Danville. A total of 45 Vtrans staff and 41 municipal road crew members, local officials and regional planners being trained.

In 2015 the Tier 2 format was modified slightly to mix participants from Vtrans with those from municipalities. One state/municipal training was offered at the Vtrans Training Center and three were held regionally in Danville, Cambridge and Wilmington. In addition, one special training was held for regional planning commission transportation planners and another was held for private sector engineers, both of these were offered at the Vtrans Training Center in Berlin. Ninety nine participants attended the Tier Two trainings in 2015 and total of 290 Tier Two participants have attended over the entire four years of training.

Mixing participants from the various organizations is advantageous because it opens up regional training sites to both Vtrans and municipal staff and allows for state-municipal cross-pollination that results in technical transfer and the development of greater appreciation differing perspectives. There were many instances during the state/municipal trainings in which Vtrans and municipal participants conversed about the whys and hows of each-others' projects. The Regional Planning Transportation Planner training was held at the request of Vtrans transportation planning staff as part of the Vtrans Transportation Planning Initiative. The private sector engineer training was the first of hopefully several offerings to the private sector engineering community.

### *Tier 3 Trainings*

Tier 3 trainings will be directed at both the engineering and construction level audiences and focus on design and construction oversight of river management practices. Subject matter will be taken primarily from the Vermont River Management Standard Principles and Practices document (2014). The tier 2 training will be a prerequisite to the T3 training.

The training is currently under development by a private contractor under a contract with the Lake Champlain Basin Program. The Basin Program's interest in funding development of the Tier 3 training stems from it's priorities for improving the water quality of Lake Champlain and its watersheds both in Vermont and New York. In January 2015 with assistance from the Vermont and New York DEC's, the Basin Program developed and released an RFP and awarded a contract for Tier 3 development to be utilized in both Vermont and New York. As part of the contract, pilot trainings will be held in both Vermont and New York. Project deliverables are due and the contract ends on December 31, 2016.

## **Going Forward**

### *Tier 1*

Tier 1 trainings will continue to be delivered via the internet as a self-guided training that is required as a prerequisite to Tier 2 and available to anybody with internet access.

## Tier 2

Planning for the 2016 Tier 2 training schedule, including assessment of remaining demand, is underway and the results of demand assessment will influence scheduling. However, based on previous demand estimates and the number of participants trained to date; preliminary plans are to hold three state/municipal trainings, one private sector engineer training and an inaugural private sector equipment operator training in 2016.

Figure 2 shows that after the single pilot training in 2012 there was a peak in Vtrans participation in 2013 and Vtrans numbers have declined each year since then. In total 164 of the estimated 200 Vtrans participants have attended the Tier 2 training. Vtrans management is currently working to revise its estimate of continued demand for Tier 2 training. It is expected that Vtrans staff participation will decrease as the total number of staff approaches the original estimate of 200. However, staff turnover and the potential interest in refresher trainings will likely mean that an estimated 10 - 20 Vtrans staff members will require training each year going forward.

With 255 municipalities across the State, it was originally estimated that a total of 350 municipal road crew personnel would participate in the T2 trainings over time. However, that estimate assumed that in most cases, only road foremen would attend. The experience has been that many towns send several if not all of their road crew staff to Tier Two trainings. A reasonable revision of the estimated number of municipal staff interested in Tie 2 trainings would probably be in the range of 550 – 650. Staff turnover within Vtrans and municipal crews is also a reality that must be kept in mind. To accommodate the estimated level of demand three Vtrans-Municipal trainings are planned for years 2016 through 2018 (figure 3). At the end of the 2018 field-training season, the remaining training need will be assessed and inform further T2 offerings.

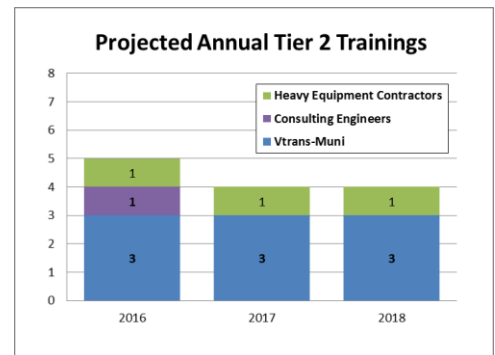


Figure 3. Planned Tier 2 Trainings 2015 - 2018

In 2014 a representative of the Forest Parks and Recreation Department attended a Tier 2 Training to assess the appropriateness of the training for State and private sector consulting foresters. In follow up discussions Forest Parks and Recreation has indicated it believes there would be value in educating foresters on river processes and he would like to organize a series of Rivers and Roads trainings for foresters. No firm plans have been developed on this initiative but The Rivers Program agrees with the Forest Parks and Recreation Department's assessment and plans to coordinate on organizing trainings for foresters as soon as possible.

## Tier 3

The Tier 3 training program is being developed by a private sector consultant as part of a grant funded project overseen by the Lake Champlain Committee and in consultation with Rivers and Roads Training Program staff. Development is set to begin in March of 2015 and be completed in April 2016 with one pilot training taking place during the contract period. Once the final products are delivered a long term plan will be developed for training delivery. In the meantime, Vermont DEC will seek funding to contract for delivery of several additional Tier 3 trainings in 2016 and 2017.

It is estimated that 40 Vtrans staff and 50 non-Vtrans transportation infrastructure professionals will be interested in Tier 3 trainings. Because of their advanced and in-depth nature, the Tier 3 training will be developed as a series of modules with each module addressing approximately two stream alteration practices. Each Tier 3 training participant will have the option of participating in one or more Tier 3 training module. It is anticipated that approximately three to four

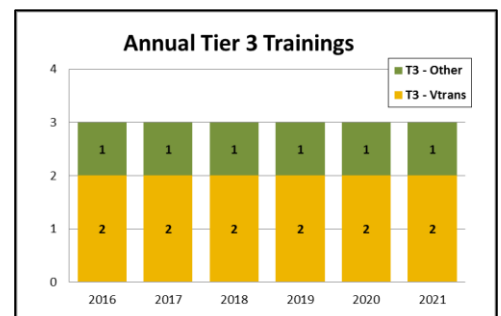


Figure 4. Planned Tier 3 Trainings 2016 - 2018



modules will comprise the Tier 3 training. Based on experience with the Tier 2 trainings it is expected that the appropriate number of individuals per training will be approximately 15. Assuming that all 90 potentially interested individuals decide to take the entire Tier 3 series, a total of 18 Tier 3 training events will need to be offered. As shown in figure 4, the current plan is to offer three Tier 3 trainings each year beginning in 2016 and running through at least 2021. In 2021 the demand for continued Tier 3 trainings will be assessed and conclusions of that assessment will inform further Tier 3 offering plans.

### Measuring Success

The best indicator of success will be the change in efficiency and effectiveness of the interactions between training participants and River Management Engineers and how river-adjacent road work gets done during post-flood recovery. However, sufficient data on this indicator would be difficult to gather and would not be available for several to many years. As a substitute, Tier 2 evaluation forms are completed by each participant at the end of every training session. These evaluations provide information on how participants feel about the training and the extent to which the training has increased the competency of participants.

Evaluations results compiled through 2015 are provided in figure 4. As shown in figure 5, ninety nine percent of participants agree that the training was a good use of their time and that the content will be applicable to their jobs with 43 percent agreeing and 54 percent agreeing strongly with each statement.

The Tier 2 training program is significantly increasing Vermont's transportation infrastructure professional's abilities to consider and accommodate river stability and aquatic habitat in the design and construction of flood recovery projects. Figure 6 shows that 75 percent of Tier 2 training participants reported a moderate to very large increase (3 – 5 points) in their ability to incorporate river equilibrium and habitat elements into their flood recovery work as a result of taking the T2 training. Also shown in Figure 6 is that 74

percent of training participants report a moderate to very large increase (3-5 points) in their ability to communicate with State River Management Engineers. These changes brought about by the Rivers and Roads training program are the types of changes that must be realized if Vermont is going to meet its goals of significantly reducing the flood vulnerability of its transportation infrastructure statewide.

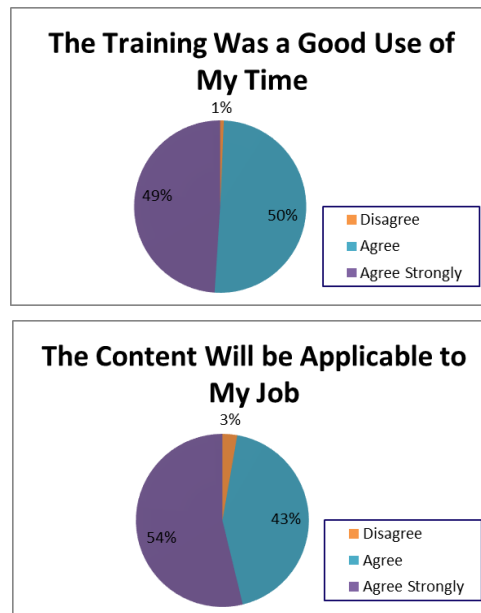


Figure 5. Participant feelings about the Tier 2 training.

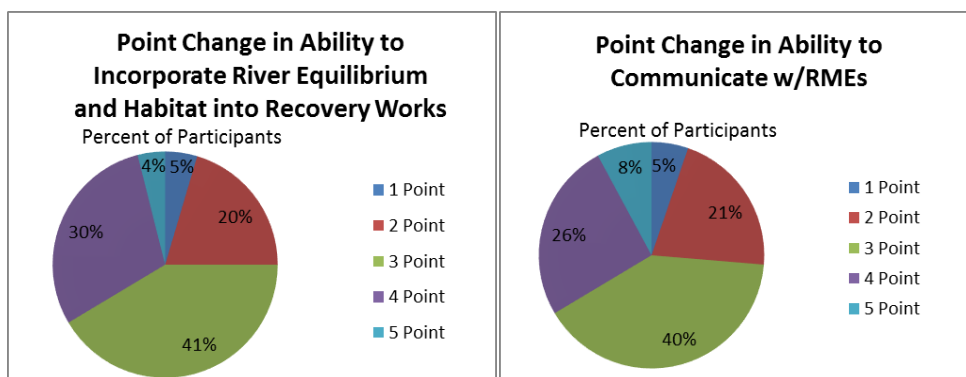


Figure 6. Change in participants abilities as a result of the Tier 2 training.